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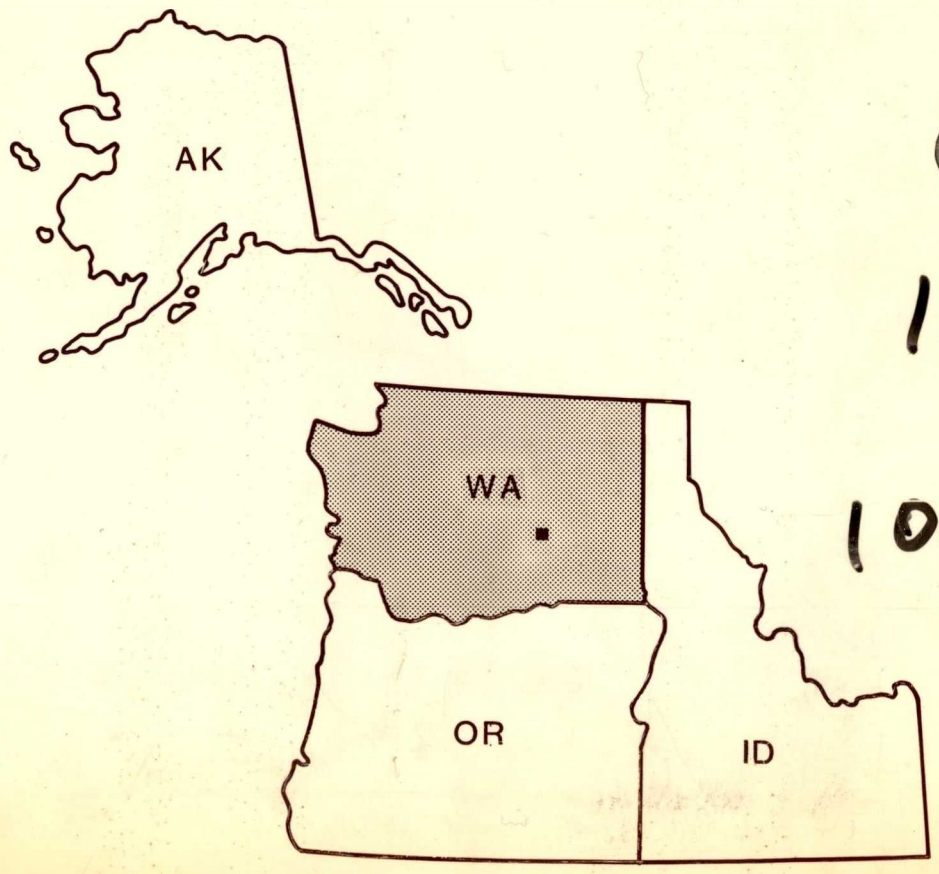
Research and Development

EPA

AERIAL PHOTOGRAPHIC ANALYSIS OF THE LARSON AFB STUDY AREA

Moses Lake, Washington

EPA Region 10



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AERIAL PHOTOGRAPHIC ANALYSIS OF THE LARSON AIR FORCE BASE STUDY AREA

Moses Lake, Washington

by

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Contract No. 68-03-3245

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ENVIRONMENTAL MONITORING SYSTEMS LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
LAS VEGAS, NEVADA 89193-3478

NOTICE

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ABSTRACT

This report presents an intensive analysis of the Larson Air Force Base study area, located north of the City of Moses Lake, Washington. Two selected dates of black-and-white panchromatic and conventional color aerial photography acquired over a 17-year period (1973-1989) were used to perform the analysis.

The Larson Air Force Base study area occupied approximately 11,573 acres throughout the analysis period. The focus of the analysis was on locating potential sources of trichloroethylene contamination which had been detected in nearby municipal wells. Several areas of solid waste disposal were identified in 1973 and in 1989. These deposits were located in gravel pits and in three landfills. A large gravel extraction pit in the southwest corner was also the scene of staining as well as solid waste disposal. Staining was noted at maintenance buildings throughout the study area. Liquid waste disposal also took the form of lagoons which were noted in 1973 and in 1989. In general, very little change was evident between the two years. Most of the disturbed ground and fill areas were probably associated with runway construction or maintenance and not with waste burial.

CONTENTS

FIGURES

TABLE

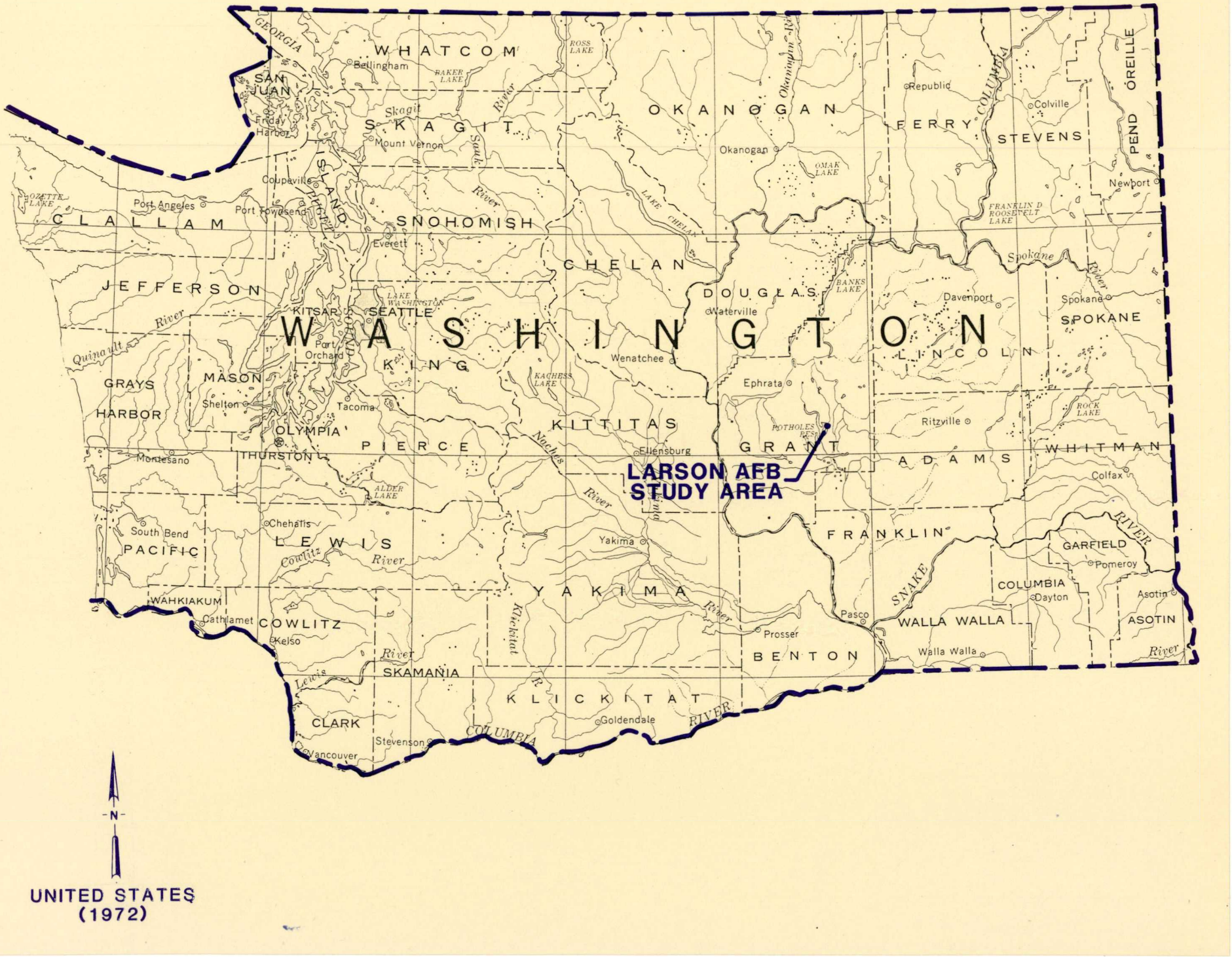

Figure 1. Site location map, Washington. Scale 1:2,500,000.

INTRODUCTION

This report presents an intensive analysis of the Larson Air Force Base study area located north of Moses Lake, Washington (Figures 1 and 2). The report was prepared to document physical conditions and potential environmental hazards at the study area through time. Two selected dates of black-and-white panchromatic and conventional color aerial photography acquired over a 17-year period (1973-1989) were used to perform the analysis.

The Larson Air Force Base was active from 1942 until 1966. Activity at the site reached a peak between 1950 and 1966. The area currently serves as the Grant County Airport. Local municipal water supply wells have been contaminated with trichloroethylene (TCE). The source of this contamination is currently unknown but is suspected to be within the old air base. The focus of the analysis is on identifying disposal and operational areas within the base that may be contaminant sources.

Background information on site conditions was provided by EPA Region 10.

This report was produced by the Environmental Protection Agency's Environmental Monitoring Systems Laboratory in Las Vegas, Nevada, at the request of the Agency's Environmental Services Division in Region 10 and Office of Emergency and Remedial Response in Washington D.C.

METHODOLOGY

Stereoscopic pairs of current and historical aerial photographs are used to perform the analysis. Stereo viewing enhances the interpretation because it allows the analyst to observe the vertical as well as horizontal spatial relationships of natural and cultural features. Stereoscopy is also an aid in distinguishing between various shapes, tones, textures, and colors that can be found within the study area.

Evidence of waste burial is a prime consideration when conducting a hazardous waste analysis. Leachate or seepage resulting from burial and dumping of hazardous materials might threaten existing surface or ground-water sources. Pools of unexplained liquid are routinely noted because they can indicate seepage from buried wastes that may enter drainage channels and allow contaminants to move off the site. An excellent indicator of how well hazardous materials are being handled at a site is the presence or absence of spills, spill stains, and vegetation damage. Trees and other forms of vegetation that exhibit a marked color difference from surrounding members of the same species are labeled "dead," "stressed," or "damaged" based upon the degree of noticeable variation. Vegetation is so labeled only after consideration of the season in which the photographs were acquired.

The U.S. Environmental Protection Agency's Statement of Procedures on Floodplain Management and Wetlands Protection (Executive Orders 11988 and 11990, respectively) requires EPA to determine if removal or remedial actions at hazardous waste sites will affect wetlands or floodplains and to avoid or minimize adverse impacts on those areas. To aid in compliance with these orders, significant wetland areas located within and adjacent to the sites have been identified and delineated. However, the sites have not been visited to verify the accuracy of wetland identification.

Drainage analysis determines the direction a spill or surface runoff would follow. Direction of drainage is determined from analysis of the photographs and from U.S. Geological Survey topographic maps. Whenever they are available, 7.5-minute quadrangle maps (scale 1:24,000) are used to show site location and to provide geographic and topographic information.

Results of the analysis are shown on annotated overlays attached to the photos. The following table provides documentation of the photographs used in this report:

TABLE 1. DOCUMENTATION OF AERIAL PHOTOGRAPHY

Site name, SSID, location, and geographic coordinates	Figures	Date of acquisition	Original scale	Film type†	Photo source‡	Photo I.D.	Frames
Larson AFB	4-9	10-04-73	1:40,000	B&W	ASCS	53025	145-215
Moses Lake, WA	11-30	07-06-89	1:9,200	CC	EMSL	89819	18-65
47°12'17"N							
119°18'56"W							
SSID# Unlisted							

†Film type identification:
B&W: Black-and-White Panchromatic
CC: Conventional Color

‡Photo source identification:
ASCS: U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Salt Lake City, Utah.
EMSL: U.S. Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Las Vegas, Nevada.

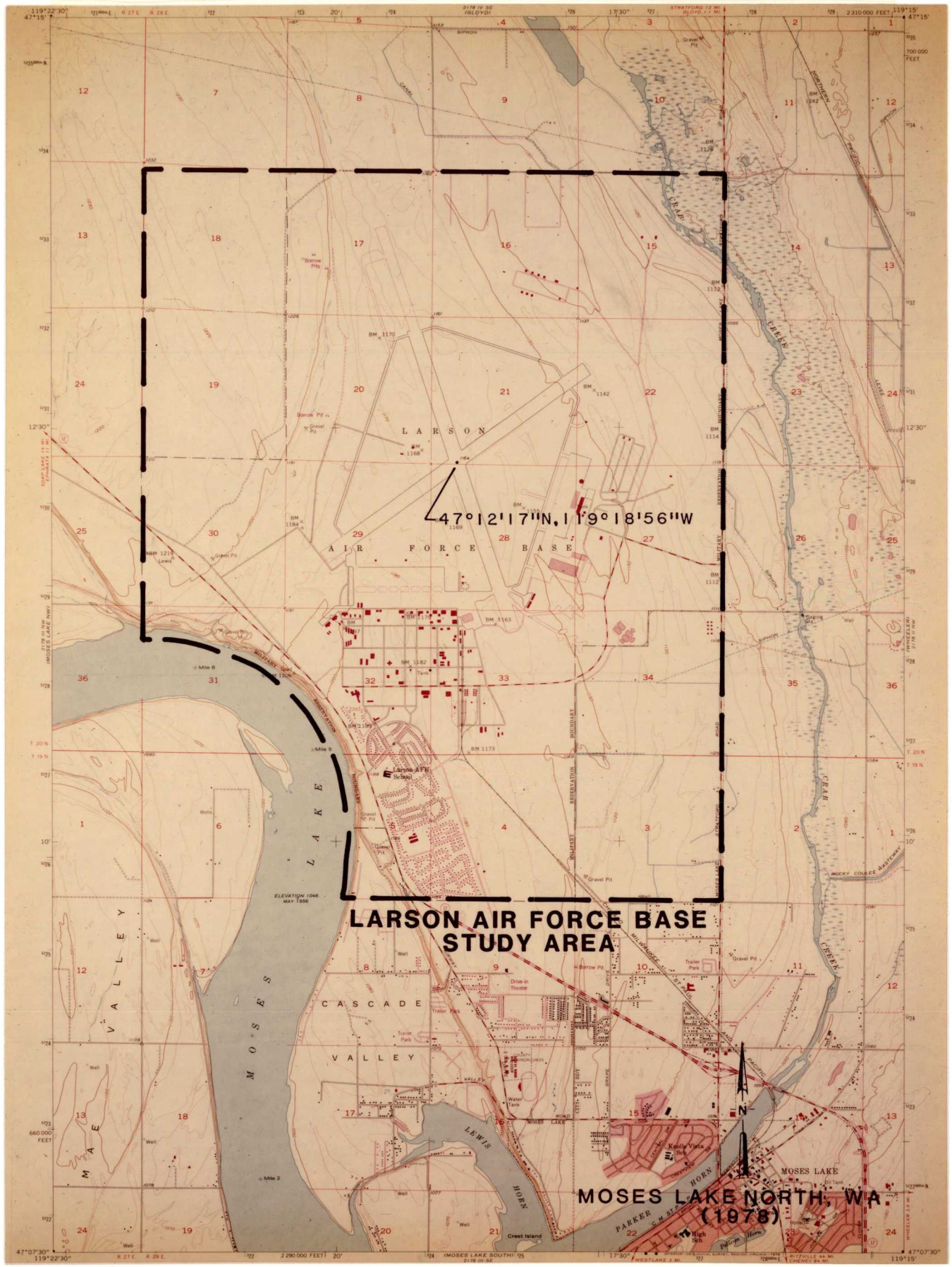

Figure 2. Local site location map, Moses Lake, Washington. Scale 1:60,000.

ANALYSIS SUMMARY

The Larson Air Force Base study area is located immediately north of the City of Moses Lake, Washington. The study area occupied 11,573 acres throughout the analysis period. Historical and current aerial photography acquired in 1973 and 1989 was used to perform the analysis.

Terrain at the site consists of old dune topography with several long north-south trending slopes. Drainage throughout the study area is generally to the south; however, many internal drainages are present. The primary surface water resources in the study area are Moses Lake, which is a reservoir and Crab Creek which is a perennial stream located in the northeast corner. Other surface drainages in the area are a short intermittent stream west of the runways and several channels associated with agriculture in the eastern section of the study area. Several wetland ecosystems are associated with Crab Creek and with irrigation runoff in the fields. An approximately 100-foot scarp along Moses Lake would prevent any effects of a 100-year flood from reaching developed areas in the study area; however, flooding along Crab Creek may have an effect.

Larson Air Force Base occupies most of the study area with aircraft operation and maintenance facilities, and a major residential area is also present. In general, very little change was noted in the area between 1973 and 1989. Solid waste was disposed of in old gravel pits at two locations in 1973 on the east and west sides of the area. These two deposits showed a similar appearance in 1989 suggesting that actual burial of the waste may not have occurred. Solid waste was also observed at a probable landfill in the southeast part of the area in 1973. This area also showed no change by 1989. Liquid waste handling in the area consisted of six stains and eight lagoons in 1973. The stains were located outside maintenance areas and in liquid loading areas. An extensive gravel extraction/waste disposal area was located in the southern corner of the study area in 1973. Significant staining and some solid waste disposal was observed at this time. By 1989 the amount of staining and waste disposal had increased and a landfill was present. New landfilling was also identified at gravel pits in the southwest corner in 1989. Solid waste burial in a trench was also noted. Throughout the study area mounds of dark solid material were visible in 1973 and 1989. These appeared to be gravel or asphalt associated with runway construction or maintenance. No waste disposal was evident at most of the fill and disturbed ground areas.

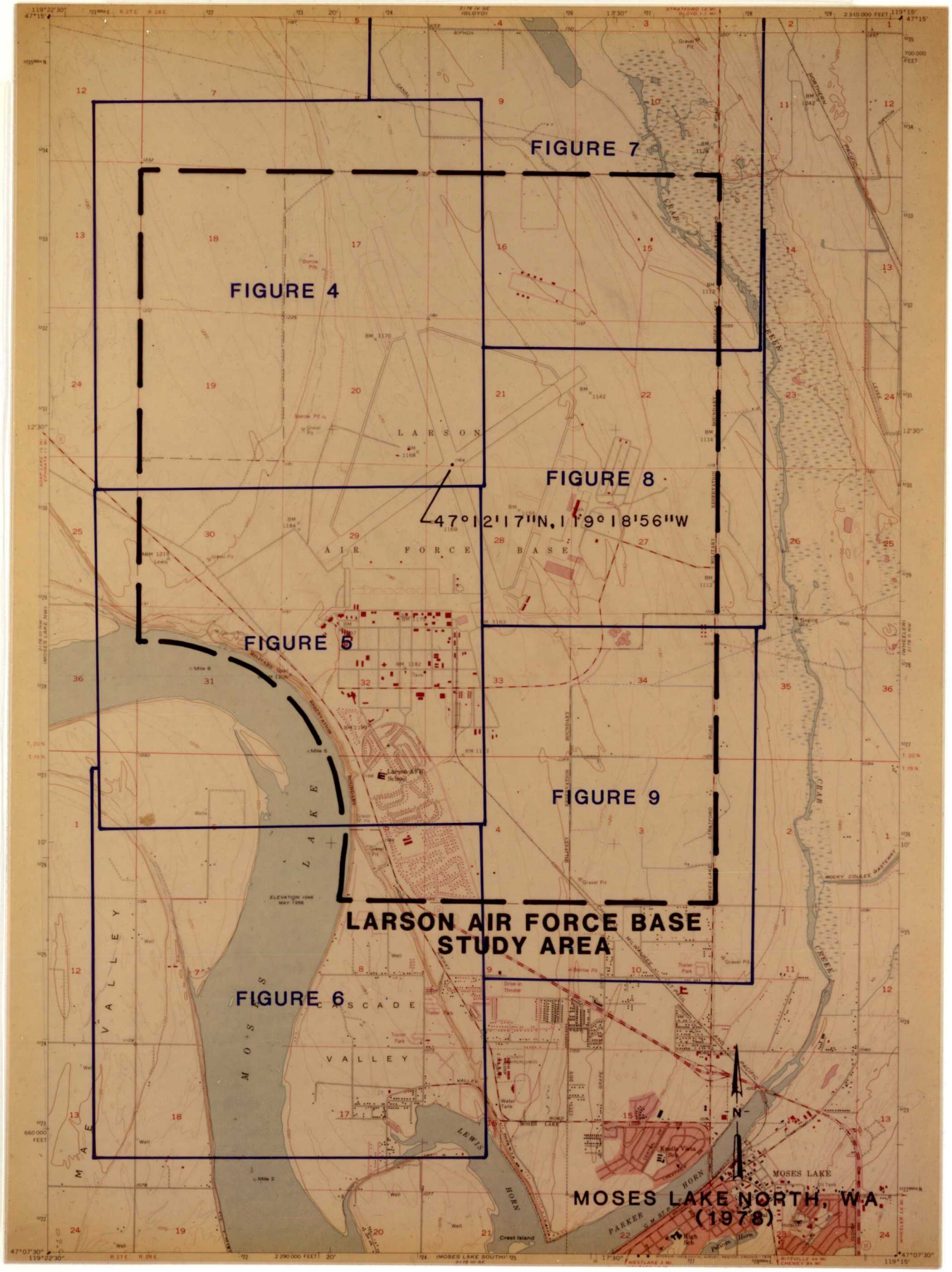

Figure 3. Photo-coverage map, 1973. Scale 1:60,000.

PHOTO ANALYSIS

OCTOBER 4, 1973 (1 of 6)

Figure 4 shows the northwest corner of the study area. Several features are noted which might indicate waste handling or disposal. Potential environmental hazardous are:

SW-1 This accumulation of miscellaneous light- and dark-toned solid material has been deposited in what appears to be an old gravel pit.

Annotations A: These are areas of a mounded dark solid material. They appear to be asphalt or a similar substance.

Annotation B: These are two probable burn areas. Rows of crates or other objects are visible in the center of both areas. Containment ditches surround both of them.

Annotation C: This area of light-toned ground appears to be the result of dumping of ash or concrete on the ground. A pit is noted in the southern part of this area. A darker tone is shown by what appears to be gravel spread over the ground surface.

TR-1: No burial activity is visible in this large trench.

Additional features of interest on this frame are an extensive area of disturbed ground. No waste disposal can be confirmed in this area or at the mound of fill material.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
- SL — STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM — MOUNDED MATERIAL (SMALL)
- CR — CRATES/BOXES
- DR — DRUMS
- HT — HORIZONTAL TANK
- PT — PRESSURE TANK
- VT — VERTICAL TANK
- CA — CLEARED AREA
- DG — DISTURBED GROUND
- FL — FILL
- IM — IMPOUNDMENT
- LG — LAGOON
- OF — OUTFALL
- SD — SLUDGE
- ST — STAIN
- SW — SOLID WASTE
- TR — TRENCH
- VS — VEGETATION STRESS
- WD — WASTE DISPOSAL AREA
- WL — WETLAND

Figure 4. Larson AFB study area, October 4, 1973 (1 of 6). Approximate scale 1:20,000.

Figure 5 shows the southwest corner of the study area. Several gravel pits are present in this part of the study area. The main Air Force Base facilities and some residential areas are also noted. Potential environmental hazards are:

Annotations A: Mounds of dark solid material are visible at three new locations on this frame. This appears to be the same material as previously described.

ST-1: Numerous dark liquid stains are visible in these two areas. They are probably the result of disposal of relatively small amounts of waste liquid on the ground.

ST-2: Two areas of heavy dark staining are noted near the bulk liquid storage area. The extent and location of this staining suggest that it may be associated with ground oiling as part of dust suppression measures.

Other significant features are an extensive area of spoil and disturbed ground at the end of a main runway. No waste disposal is noted at this area or at the other fill areas on this frame. Twenty-one horizontal and three vertical tanks are present along the railroad tracks as well as several pressure tanks.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
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TRANSPORTATION/UTILITY

- VEHICLE ACCESS
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SITE FEATURES

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- MOUNDED MATERIAL (EXTENSIVE)
- MM — MOUNDED MATERIAL (SMALL)

CR	CRATES/BOXES
DR	DRUMS
HT	HORIZONTAL TANK
PT	PRESSURE TANK
VT	VERTICAL TANK
CA	CLEARED AREA
DG	DISTURBED GROUND
FL	FILL
IM	IMPOUNDMENT
LG	LAGOON
OF	OUTFALL
SD	SLUDGE
ST	STAIN
SW	SOLID WASTE
TR	TRENCH
VS	VEGETATION STRESS
WD	WASTE DISPOSAL AREA
WL	WETLAND

Figure 5. Larson AFB study area, October 4, 1973 (2 of 6). Approximate scale 1:20,000.

The photograph (Figure 6) provides coverage of a large gravel pit complex adjacent to the base residential area. The surrounding agricultural land of Cascade Valley is also visible. Potential environmental hazards are:

SW-2: Two accumulations of solid waste located adjacent to a shallow pit.

ST-3: Numerous light- and dark-toned streaks are visible on the slope of the gravel pit along Airway Road. These may be from disposal of solid or liquid material.

ST-4: Heavy dark staining is noted at this point. The source is not evident.

ST-5: The source of this dark stain near a small building is not evident.

TR-2: Two small trenches are visible behind the same building as ST-5. They appear to be associated with construction activity.

In addition, large pools of standing water and process water from the gravel washing operations are located in the bottom of the gravel pits.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
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TRANSPORTATION/UTILITY

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SITE FEATURES

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- WL — WETLAND

Figure 6. Larson AFB study area, October 4, 1973 (3 of 6). Approximate scale 1:20,000.

Figure 7 shows the northeast corner of the study area. Extensive wetlands are visible in association with Crab Creek, and with agricultural fields in this same area. No potential environmental hazards are visible on this frame which have not been previously discussed. The cause of the area of ground scarring is not apparent.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
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TRANSPORTATION/UTILITY

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SITE FEATURES

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- VS VEGETATION STRESS
- WD WASTE DISPOSAL AREA
- WL WETLAND

Figure 7. Larson AFB study area, October 4, 1973 (4 of 6). Approximate scale 1:20,000.

The east-central section of the study area shows several significant features. Potential environmental hazards are:

Annotation A: The mounded solid material near the moist area shows a lighter tone than other material similarly identified.

Empty LG-1: This lagoon is unlined and contains no liquid at the time of this photography.

TR-3: No waste disposal can be seen in this trench.

SW-3&4: The solid waste at these locations shows a mottled texture, but the composition of the material is not identifiable.

ST-6: This is a dark liquid spill stain which originates in the adjacent maintenance building.

LG-2-8: These are waste water treatment lagoons which are under construction. Two of them already contain liquid. They appear to be lined.

Liquid Waste: A significant amount of dark liquid has been dumped into a basin adjacent to the new treatment lagoons. This liquid drains northwest toward the treatment plant. The basin is unlined.

Other features of interest on this frame are extensive areas of ground scarring in the northern part of the frame. The cause of these scars is not apparent. A moist area is also noted in a third area of ground disturbance. This does not appear to be associated with any waste disposal. No leakage or spillage is visible within the containment dikes of the eight storage tanks or at the loading racks.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

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DRAINAGE

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Figure 8. Larson AFB study area, October 4, 1973 (5 of 6). Approximate scale 1:20,000.

Figure 9 completes the 1973 coverage of the study area. An extensive agricultural area is present in the southeast corner of the area. These fields lie outside the military reservation boundary. Drainage throughout this area is to the south. Potential environmental hazardous are:

Probable Landfill-1: This mounded area shows signs of waste disposal. A significant accumulation of solid waste (SW-5) is noted on an outboard slope of the landfill's northern side.

In addition, an area of disturbed ground is located further south.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

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Figure 9. Larson AFB study area, October 4, 1973 (6 of 6). Approximate scale 1:20,000.

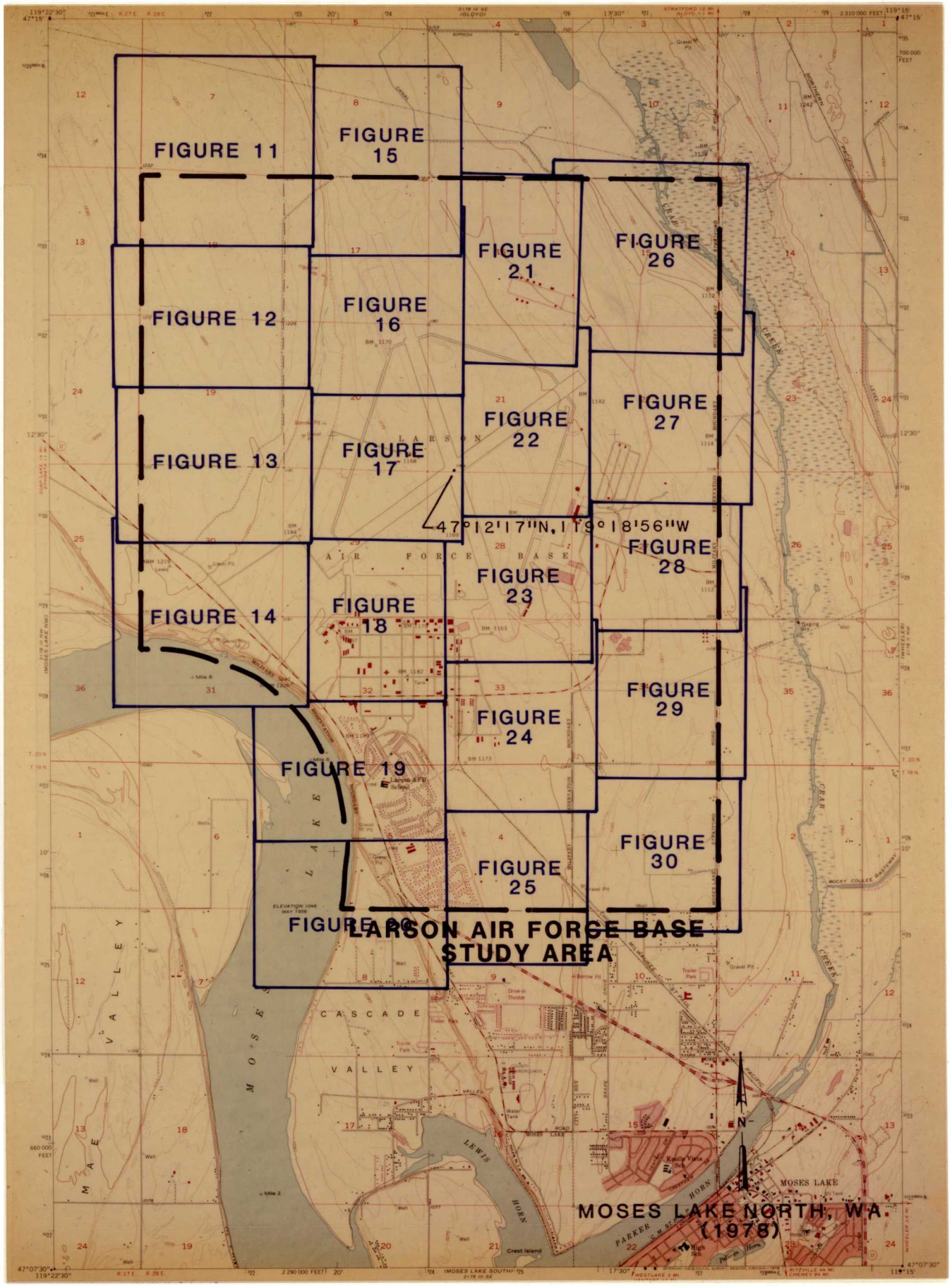

Figure 10. Photo-coverage map, 1989. Scale 1:60,000.

JULY 6, 1989 (1 of 20)

Figure 11 shows the northwest corner of the study area. No activity of any kind is visible in this area, which consists of undisturbed desert.

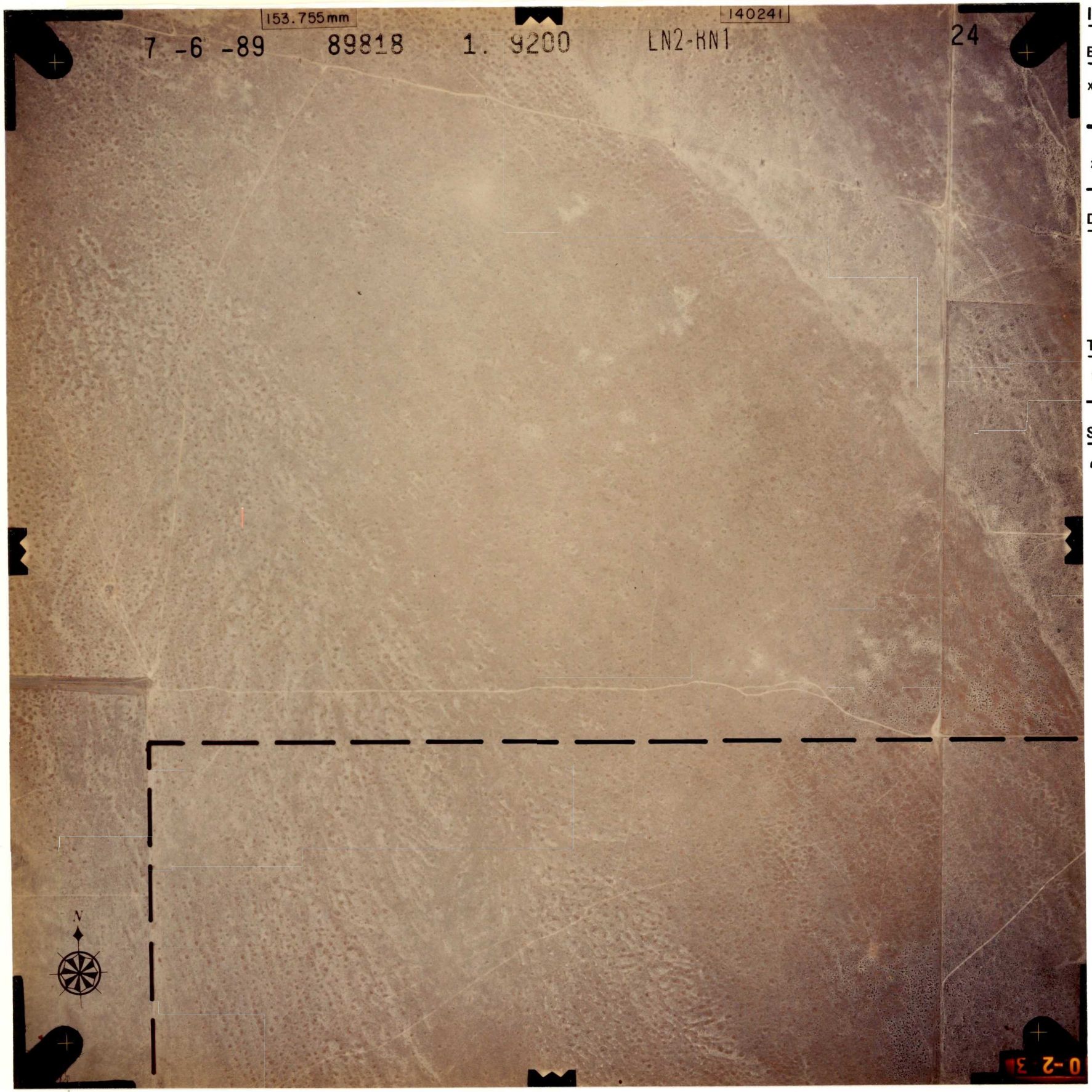

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Figure 11. Larson AFB study area, July 6, 1989 (1 of 20). Approximate scale 1:9,200.

JULY 6, 1989 (2 of 20)

Figure 12 shows the western edge of an agricultural field which corresponds to the military reservation boundary. No other activity is visible.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
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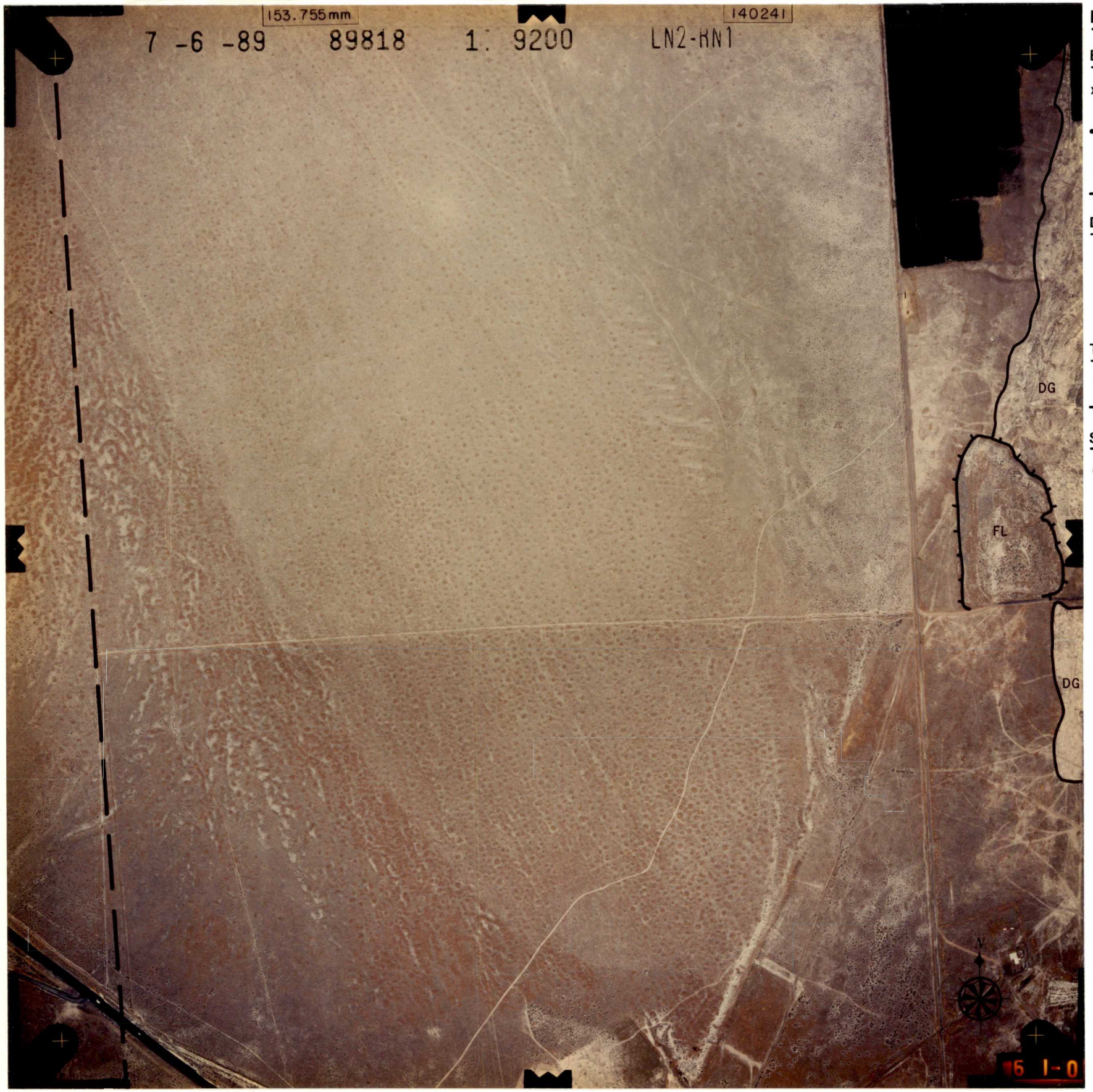
Figure 12. Larson AFB study area, July 6, 1989 (2 of 20). Approximate scale 1:9,200.

Figure 13 shows the western edge of an area of disturbed ground which will be discussed on page 34. No other activity is noted.



INTERPRETATION CODE

BOUNDARIES AND LIMITS

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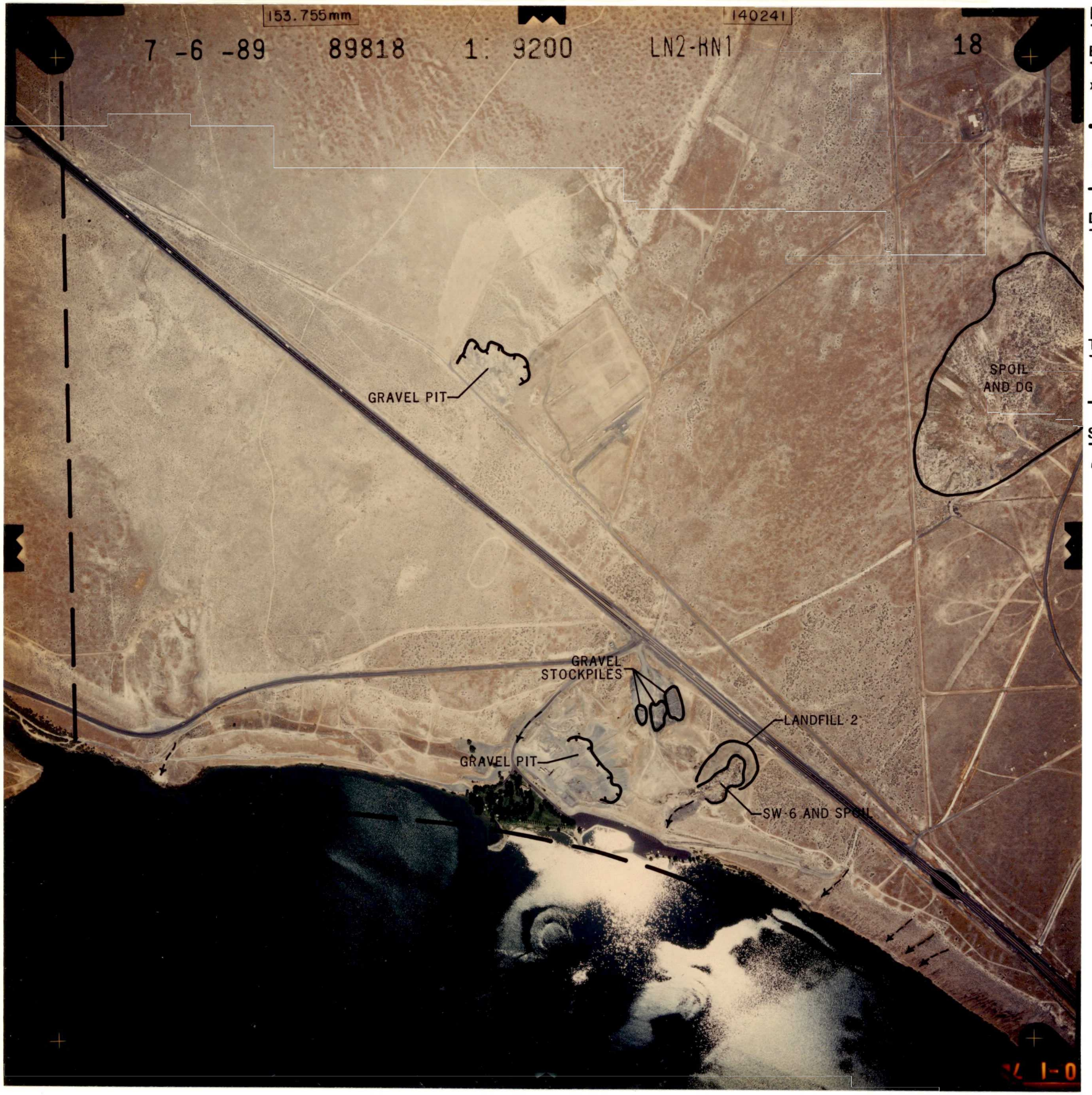
Figure 13. Larson AFB study area, July 6, 1989 (3 of 20). Approximate scale 1:9,200.

Figure 14 provides coverage of the southwest corner of the study area. Two gravel pits are present. These pits were also noted in 1973. Potential environmental hazards are:

Landfill-2: This is an area of an old gravel pit which has been filled with solid waste and spoil. No vehicle activity is currently visible nor is any liquid disposal.

SW-6 & Spoil: A significant accumulation of mixed spoil and solid waste is noted at this location. Much of the spoil appears to be concrete construction rubble. Several metal objects of various sizes are also visible. The presence of vegetation on most of the spoil suggests that little new disposal has occurred for some time. Drainage from this area is directly to Moses Lake via the parking lot to the south.

An area of spoil and disturbed ground will be discussed on page 36.



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DRAINAGE

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TRANSPORTATION/UTILITY

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- RAILWAY

SITE FEATURES

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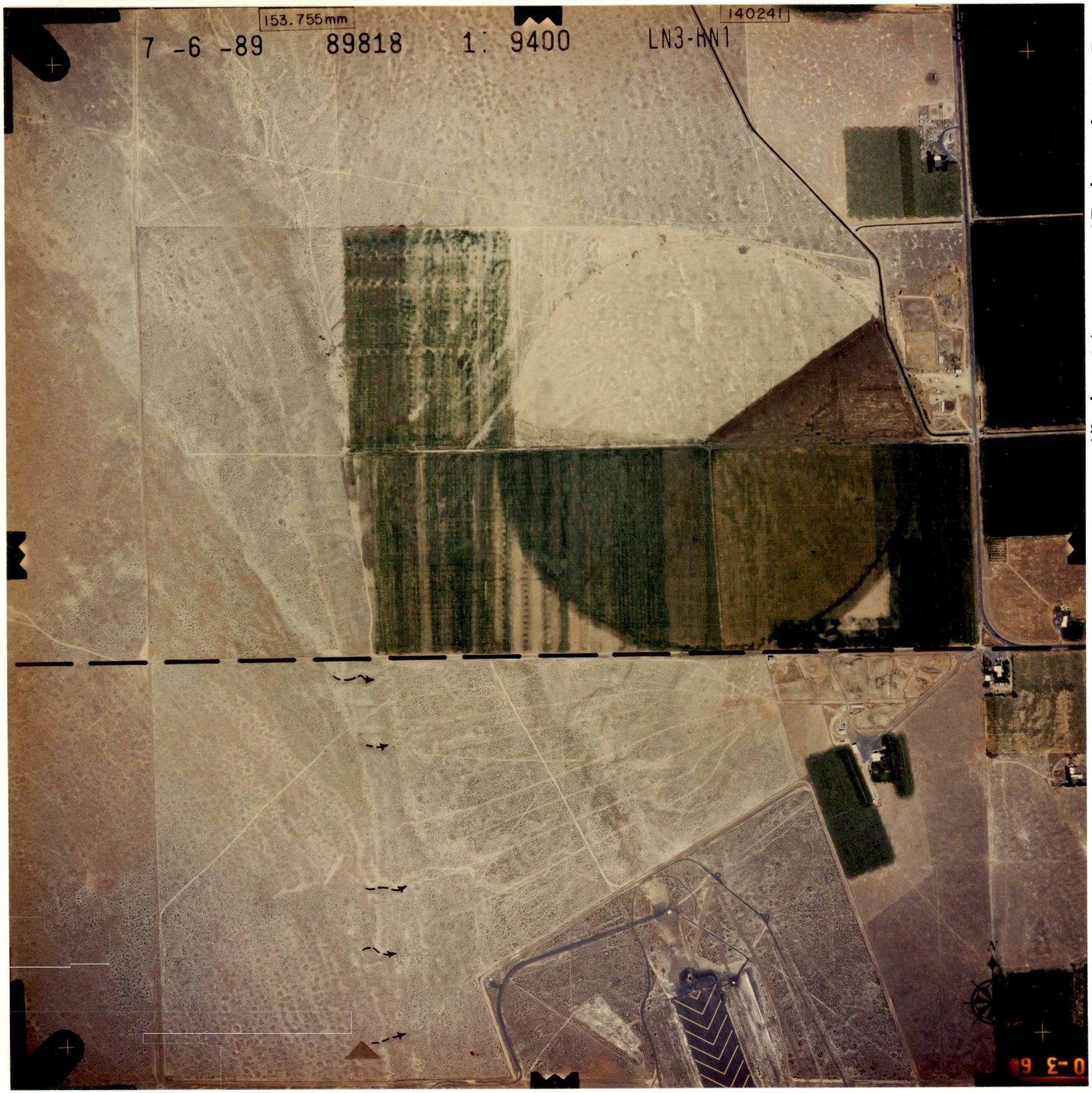
- CA — CLEARED AREA
- DG — DISTURBED GROUND
- FL — FILL
- IM — IMPOUNDMENT
- LG — LAGOON
- OF — OUTFALL
- SD — SLUDGE
- ST — STAIN
- SW — SOLID WASTE
- TR — TRENCH
- VS — VEGETATION STRESS
- WD — WASTE DISPOSAL AREA
- WL — WETLAND

Figure 14. Larson AFB study area, July 6, 1989 (4 of 20). Approximate scale 1:9,200.

Figure 15 shows the north end of the main runway at the airport. What appear to be feedlots and an irrigation area are the only active operations noted on this frame. No potential environmental hazards are evident.



INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

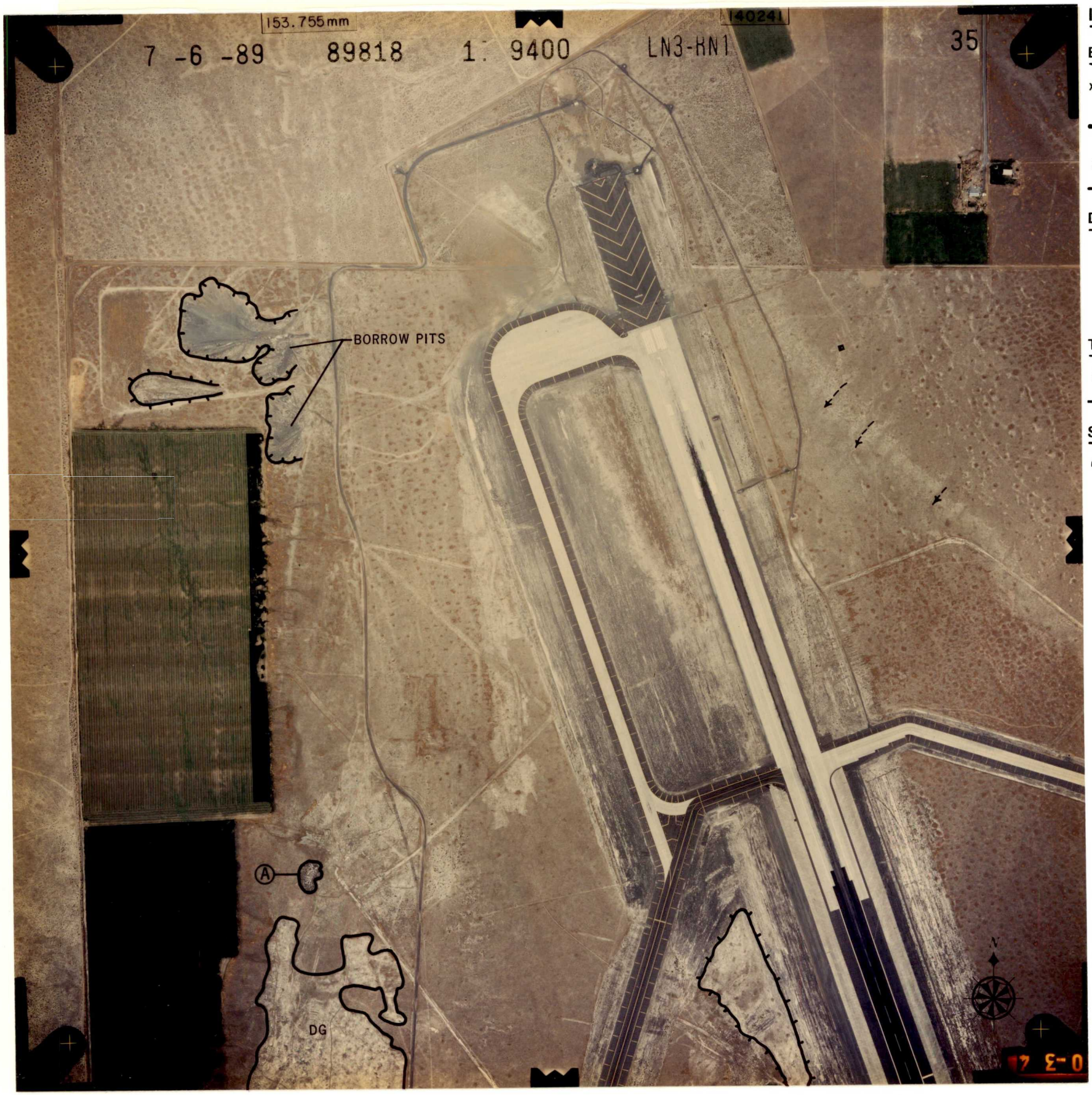
SITE FEATURES

- DIKE
- STANDING LIQUID
- SL — STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM — MOUNDED MATERIAL (SMALL)
- CR — CRATES/BOXES
- DR — DRUMS
- HT — HORIZONTAL TANK
- PT — PRESSURE TANK
- VT — VERTICAL TANK
- CA — CLEARED AREA
- DG — DISTURBED GROUND
- FL — FILL
- IM — IMPOUNDMENT
- LG — LAGOON
- OF — OUTFALL
- SD — SLUDGE
- ST — STAIN
- SW — SOLID WASTE
- TR — TRENCH
- VS — VEGETATION STRESS
- WD — WASTE DISPOSAL AREA
- WL — WETLAND

Figure 15. Larson AFB study area, July 6, 1989 (5 of 20). Approximate scale 1:9,400.

Figure 16 shows no new activity since 1973. The extent of the borrow pits and runways are the same as in that year. Potential environmental hazards are:

Annotation A: This dark solid material shows no change since 1973.



INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
- SL — STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM — MOUNDED MATERIAL (SMALL)
- CR — CRATES/BOXES
- DR — DRUMS
- HT — HORIZONTAL TANK
- PT — PRESSURE TANK
- VT — VERTICAL TANK
- CA — CLEARED AREA
- DG — DISTURBED GROUND
- FL — FILL
- IM — IMPOUNDMENT
- LG — LAGOON
- OF — OUTFALL
- SD — SLUDGE
- ST — STAIN
- SW — SOLID WASTE
- TR — TRENCH
- VS — VEGETATION STRESS
- WD — WASTE DISPOSAL AREA
- WL — WETLAND

Figure 16. Larson AFB study area, July 6, 1989 (6 of 20). Approximate scale 1:9,400.

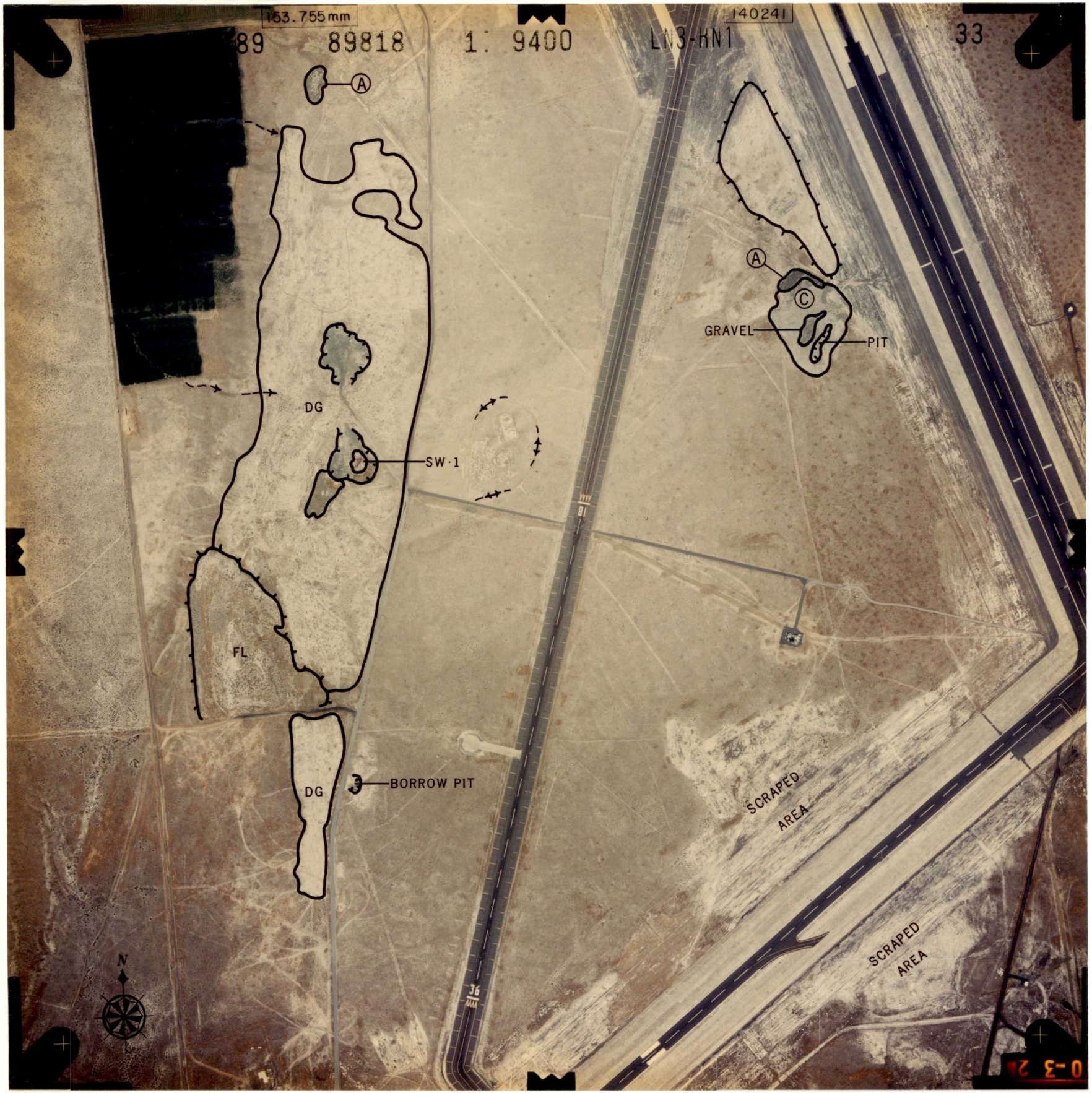
Figure 17 shows several features of interest. Potential environmental hazards are:

Annotation A: The eastern accumulation of this solid material shows no change since 1973. No change is evident at the nearby gravel or at the pit and disturbed ground in this area.

Annotation C: No change is evident.

SW-1: The solid waste in this excavation consists of what appears to be construction rubble, crates, various rusting metal objects, and a grey-ash-like material. The extent of this solid waste seems to have increased since 1973.

Additionally, no change is noted at the disturbed ground areas or at the scraped areas on this frame. The previous burn areas now show a light soil tone.



INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
- SL STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM MOUNDED MATERIAL (SMALL)

- CR CRATES/BOXES
- DR DRUMS
- HT HORIZONTAL TANK
- PT PRESSURE TANK
- VT VERTICAL TANK

- CA CLEARED AREA
- DG DISTURBED GROUND
- FL FILL
- IM IMPOUNDMENT
- LG LAGOON
- OF OUTFALL
- SD SLUDGE
- ST STAIN
- SW SOLID WASTE
- TR TRENCH
- VS VEGETATION STRESS
- WD WASTE DISPOSAL AREA
- WL WETLAND

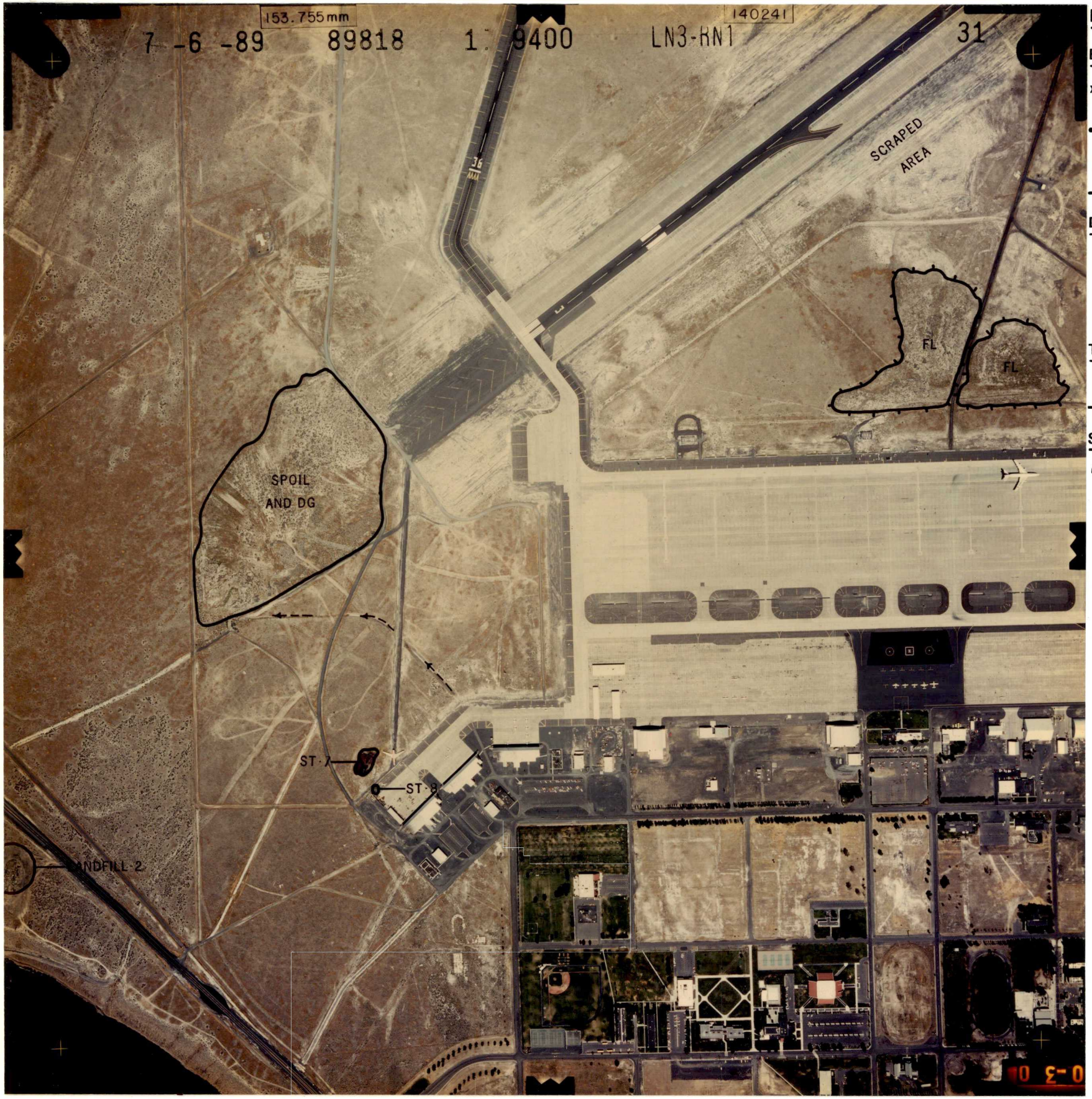
Figure 17. Larson AFB study area, July 6, 1989 (7 of 20). Approximate scale 1:9,400.

The photograph (Figure 18), shows two new features. Potential environmental hazards are:

ST-7: This is a fairly large dark oily liquid stain located on bare soil within a depression. The source is probably disposal of liquid from the maintenance buildings to the southeast.

ST-8: This is a small liquid release from the maintenance building nearby. It is located on pavement.

In addition, no change is noted at the extensive area of spill and disturbed ground. No waste disposal is evident at the fill area in the northeast part of the frame.



INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
- SL STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM MOUNDED MATERIAL (SMALL)
- CR CRATES/BOXES
- DR DRUMS
- HT HORIZONTAL TANK
- PT PRESSURE TANK
- VT VERTICAL TANK
- CA CLEARED AREA
- DG DISTURBED GROUND
- FL FILL
- IM IMPOUNDMENT
- LG LAGOON
- OF OUTFALL
- SD SLUDGE
- ST STAIN
- SW SOLID WASTE
- TR TRENCH
- VS VEGETATION STRESS
- WD WASTE DISPOSAL AREA
- WL WETLAND

Figure 18. Larson AFB study area, July 6, 1989 (8 of 20). Approximate scale 1:9,400.

Figure 19 shows no significant change from 1973, and no potential environmental hazards are visible.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
- SL STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM MOUNDED MATERIAL (SMALL)

- CR CRATES/BOXES
- DR DRUMS
- HT HORIZONTAL TANK
- PT PRESSURE TANK
- VT VERTICAL TANK

- CA CLEARED AREA
- DG DISTURBED GROUND
- FL FILL
- IM IMPOUNDMENT
- LG LAGOON
- OF OUTFALL
- SD SLUDGE
- ST STAIN
- SW SOLID WASTE
- TR TRENCH
- VS VEGETATION STRESS
- WD WASTE DISPOSAL AREA
- WL WETLAND

Figure 19. Larson AFB study area, July 6, 1989 (9 of 20). Approximate scale 1:9,400.

Figure 20 shows a major gravel extraction pit and waste disposal area where staining and solid waste were noted in 1973. This area has been expanded since that time. Potential environmental hazards are:

Landfill-3: A mix of various solid and liquid wastes, as well as fill material or construction rubble have been dumped into the old gravel pit along this front. Numerous stains and metal objects are distinguishable.

SW-7/ST-8: This area seems to be the scene of the same type of waste disposal as at landfill-3; however, no filling of the area is apparent.

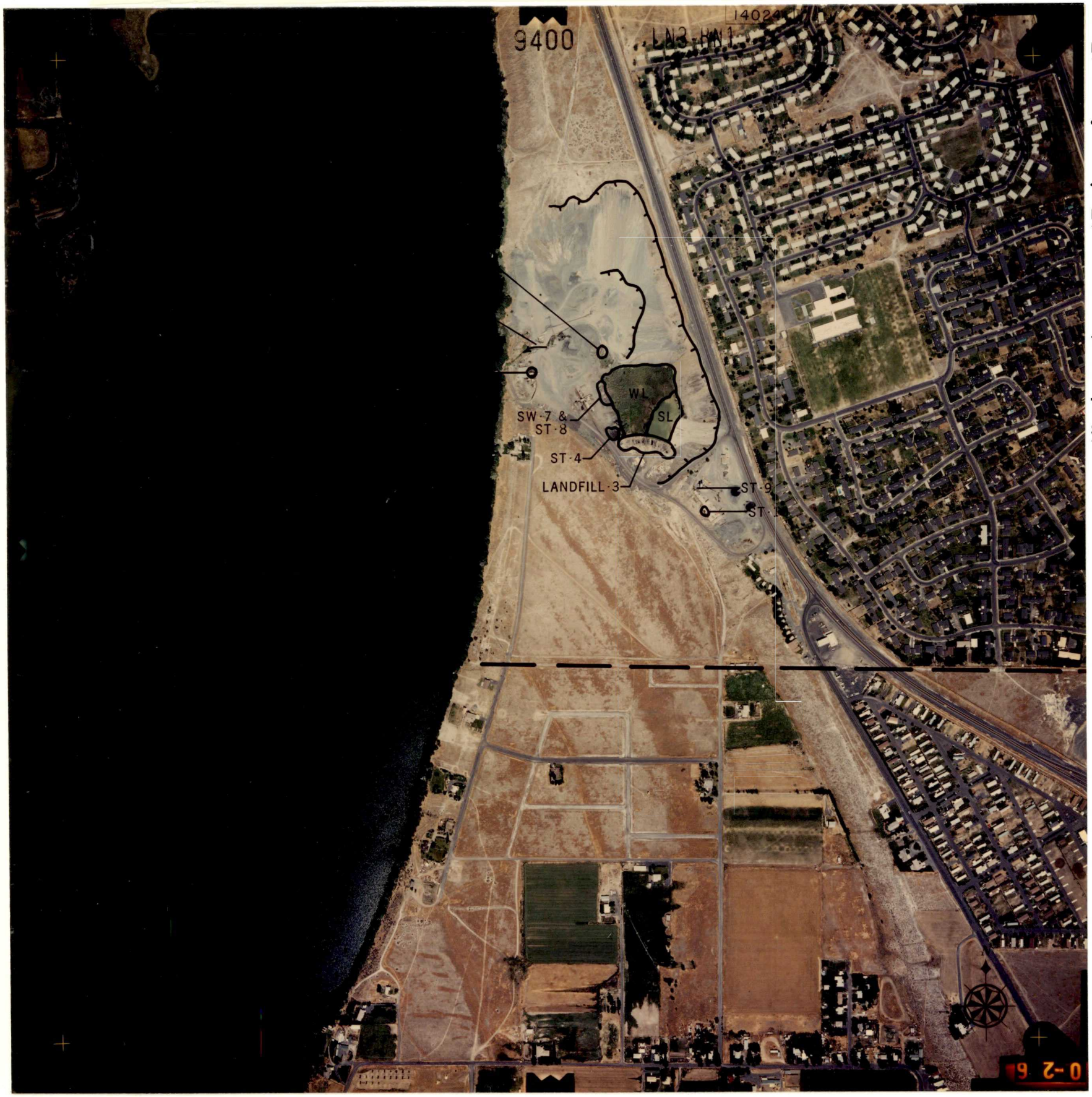
ST-4: This dark stain shows essentially the same appearance as in 1973.

ST-7: An extensive stain is visible at this point. The source appears to be rinsing operations at the garage nearby.

ST-9: This stain appears to be the result of an oily liquid spill or release from the adjacent maintenance building.

ST-10: Staining at this point is probably from leakages from drums or other containers stored along the edge of the slope. None of the stains have reached the road to the southwest.

Additional features of interest are several abandoned and rusting tanks which have been dumped near the wetland. No leakage of contaminants can be identified at these tanks.



INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
- SL — STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM — MOUNDED MATERIAL (SMALL)
- CR — CRATES/BOXES
- DR — DRUMS
- HT — HORIZONTAL TANK
- PT — PRESSURE TANK
- VT — VERTICAL TANK
- CA — CLEARED AREA
- DG — DISTURBED GROUND
- FL — FILL
- IM — IMPOUNDMENT
- LG — LAGOON
- OF — OUTFALL
- SD — SLUDGE
- ST — STAIN
- SW — SOLID WASTE
- TR — TRENCH
- VS — VEGETATION STRESS
- WD — WASTE DISPOSAL AREA
- WL — WETLAND

Figure 20. Larson AFB study area, July 6, 1989 (10 of 20). Approximate scale 1:9,400.

Figure 21 shows a relatively low level of activity in this part of the study area. Many features have the same appearance that they did in 1973. Potential environmental hazards are:

TR-1: No change or new waste disposal is evident.

The areas of ground scarring cover the same area as in 1973 and show signs of revegetation.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

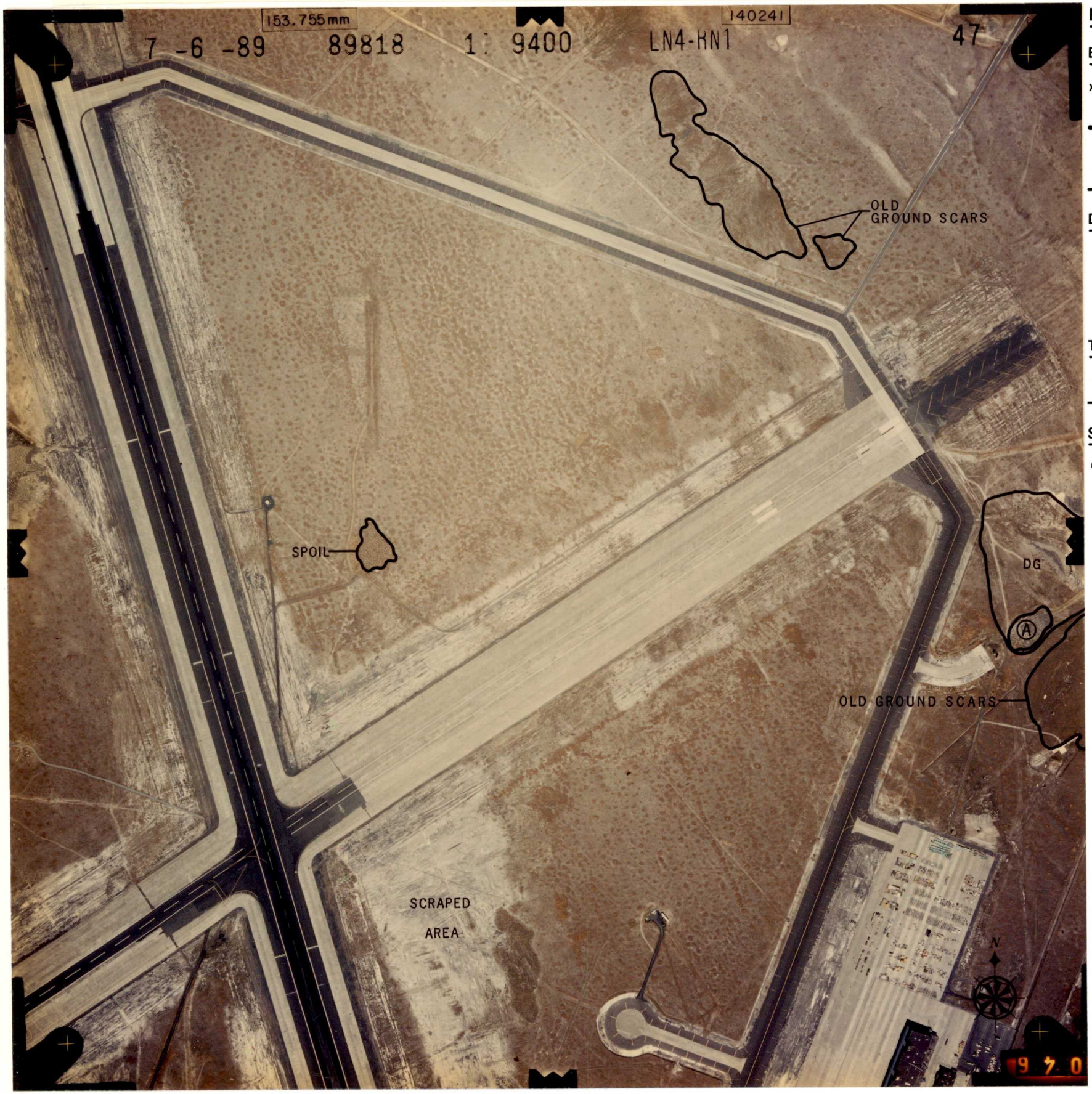
SITE FEATURES

- DIKE
- STANDING LIQUID
- SL — STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM — MOUNDED MATERIAL (SMALL)
- CR — CRATES/BOXES
- DR — DRUMS
- HT — HORIZONTAL TANK
- PT — PRESSURE TANK
- VT — VERTICAL TANK
- CA — CLEARED AREA
- DG — DISTURBED GROUND
- FL — FILL
- IM — IMPOUNDMENT
- LG — LAGOON
- OF — OUTFALL
- SD — SLUDGE
- ST — STAIN
- SW — SOLID WASTE
- TR — TRENCH
- VS — VEGETATION STRESS
- WD — WASTE DISPOSAL AREA
- WL — WETLAND

Figure 21. Larson AFB study area, July 6, 1989 (11 of 20). Approximate scale 1:9,400.

Figure 22 shows a similar lack of change at most of the study area. Potential environmental hazards are:

Annotation A: The appearance of this mounded solid material has not changed since 1973.



INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
- SL — STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM — MOUNDED MATERIAL (SMALL)
- CR — CRATES/BOXES
- DR — DRUMS
- HT — HORIZONTAL TANK
- PT — PRESSURE TANK
- VT — VERTICAL TANK
- CA — CLEARED AREA
- DG — DISTURBED GROUND
- FL — FILL
- IM — IMPOUNDMENT
- LG — LAGOON
- OF — OUTFALL
- SD — SLUDGE
- ST — STAIN
- SW — SOLID WASTE
- TR — TRENCH
- VS — VEGETATION STRESS
- WD — WASTE DISPOSAL AREA
- WL — WETLAND

Figure 22. Larson AFB study area, July 6, 1989 (12 of 20). Approximate scale 1:9,400.

In this part of the study area, several new features are present. Potential environmental hazards are:

Annotations A: Two accumulations of this solid material are covered on this frame. The northern accumulation was present in 1973 and shows no change. The southern accumulation has been deposited since then as well as the adjacent fill area. The appearance of this new solid material is the same as that of all previously identified accumulations and it is probably a dark gravel or asphalt material.

DR-1/Abandoned Tanks: A total of 46 blue and yellow drums and 4 black abandoned storage tanks are located at this point. Some discoloration of the soil is noted in this area suggesting that some leakage has occurred.

DR-2: Eight drums are being stored at this point. No leakage is visible.

ST-11: A number of minor oil spill stains are noted immediately outside a maintenance building. They are probably associated with aircraft repair operations.

ST-12: Two oil and fuel stains can be seen here. One is located below a parked airplane, while the other is in a nearby roadway. The source can not be determined.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
- SL STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM MOUNDED MATERIAL (SMALL)

- CR CRATES/BOXES
- DR DRUMS
- HT HORIZONTAL TANK
- PT PRESSURE TANK
- VT VERTICAL TANK

- CA CLEARED AREA
- DG DISTURBED GROUND
- FL FILL
- IM IMPOUNDMENT
- LG LAGOON
- OF OUTFALL
- SD SLUDGE
- ST STAIN
- SW SOLID WASTE
- TR TRENCH
- VS VEGETATION STRESS
- WD WASTE DISPOSAL AREA
- WL WETLAND

Figure 23. Larson AFB study area, July 6, 1989 (13 of 20). Approximate scale 1:9,400.

Figure 24 shows little apparent change from 1973; however, the larger scale of the 1989 photography allows more information to be extracted. Potential environmental hazards are:

DR-3: Four drums are visible at this point. A small amount of soil discoloration is associated with them.

SW-8 in TR-4: Various types of solid waste are being dumped into a narrow trench here. Brown and grey solid material can be seen as well as miscellaneous rectangular and cylindrical objects.

Probable Landfill-1: No change is evident since 1973 and the appearance of the solid waste at SW-5 is the same.

Seventeen horizontal and one vertical tanks have been removed from the area along the railroad tracks since 1973.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
- SL — STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM — MOUNDED MATERIAL (SMALL)

CR	CRATES/BOXES
DR	DRUMS
HT	HORIZONTAL TANK
PT	PRESSURE TANK
VT	VERTICAL TANK
CA	CLEARED AREA
DG	DISTURBED GROUND
FL	FILL
IM	IMPOUNDMENT
LG	LAGOON
OF	OUTFALL
SD	SLUDGE
ST	STAIN
SW	SOLID WASTE
TR	TRENCH
VS	VEGETATION STRESS
WD	WASTE DISPOSAL AREA
WL	WETLAND

Figure 24. Larson AFB study area, July 6, 1989 (14 of 20). Approximate scale 1:9,400.

JULY 6, 1989 (15 of 20)

No change is evident in this part of the study area. The disturbed ground in the east part of the frame shows signs of revegetation.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
- SL STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM MOUNDED MATERIAL (SMALL)

- CR CRATES/BOXES
- DR DRUMS
- HT HORIZONTAL TANK
- PT PRESSURE TANK
- VT VERTICAL TANK

- CA CLEARED AREA
- DG DISTURBED GROUND
- FL FILL
- IM IMPOUNDMENT
- LG LAGOON
- OF OUTFALL
- SD SLUDGE
- ST STAIN
- SW SOLID WASTE
- TR TRENCH
- VS VEGETATION STRESS
- WD WASTE DISPOSAL AREA
- WL WETLAND

Figure 25. Larson AFB study area, July 6, 1989 (15 of 20). Approximate scale 1:9,400.

JULY 6, 1989 (16 of 20)

Figure 26 shows the northeast corner of the study area. No significant activity was observed in this area in 1973 and none is evident on the 1989 photography. An extensive area of riparian wetlands are visible in the Crab Creek drainage, and wetland vegetation is also located in an old slough southwest of an irrigated area.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
- SL STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM MOUNDED MATERIAL (SMALL)

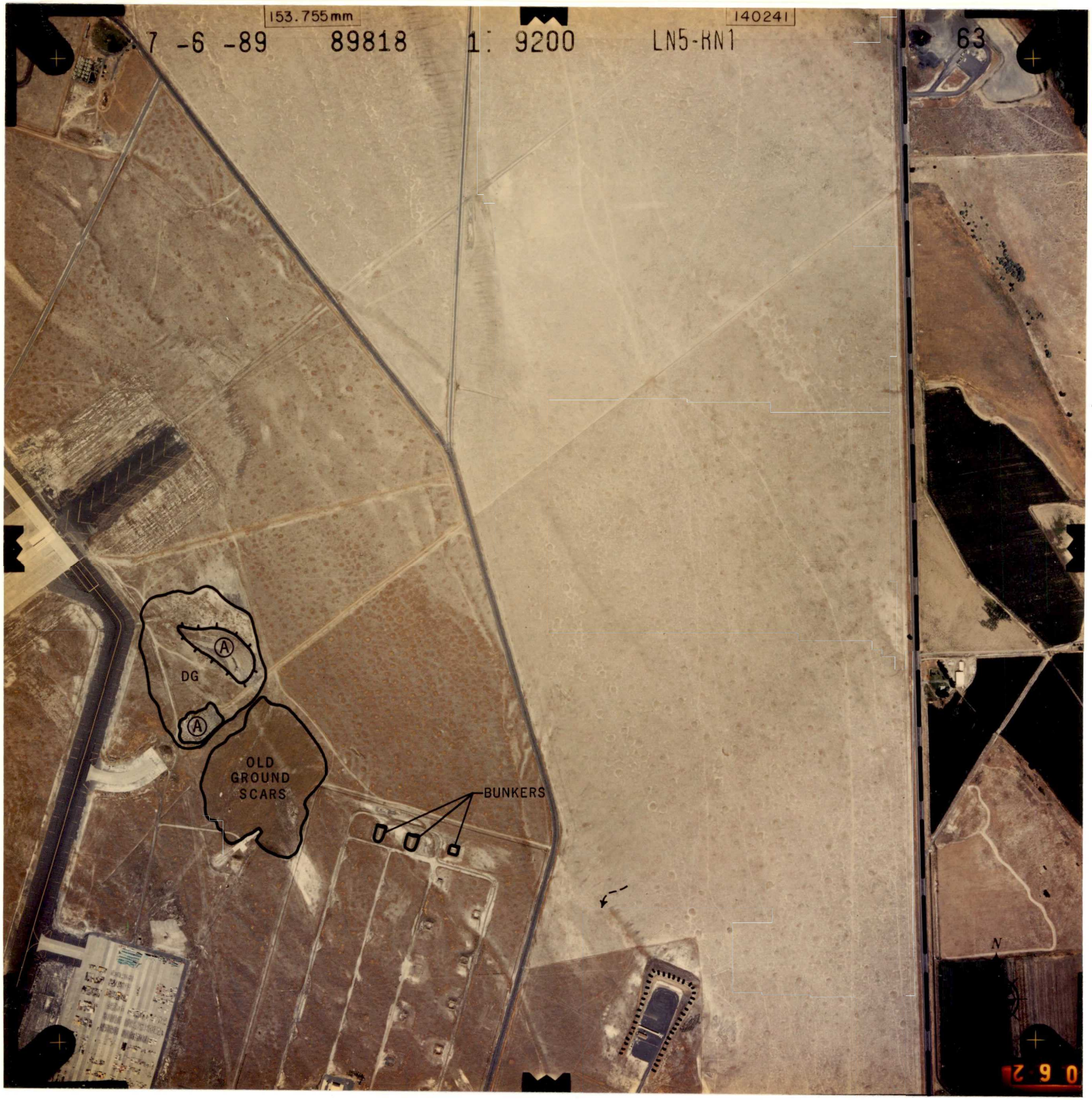
- CR CRATES/BOXES
- DR DRUMS
- HT HORIZONTAL TANK
- PT PRESSURE TANK
- VT VERTICAL TANK

- CA CLEARED AREA
- DG DISTURBED GROUND
- FL FILL
- IM IMPOUNDMENT
- LG LAGOON
- OF OUTFALL
- SD SLUDGE
- ST STAIN
- SW SOLID WASTE
- TR TRENCH
- VS VEGETATION STRESS
- WD WASTE DISPOSAL AREA
- WL WETLAND

Figure 26. Larson AFB study area, July 6, 1989 (16 of 20). Approximate scale 1:9,200.

JULY 6, 1989 (17 of 20)

No change is evident since 1973. The old ground scarring area shows signs of revegetation.



INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
- SL — STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM — MOUNDED MATERIAL (SMALL)
- CR — CRATES/BOXES
- DR — DRUMS
- HT — HORIZONTAL TANK
- PT — PRESSURE TANK
- VT — VERTICAL TANK
- CA — CLEARED AREA
- DG — DISTURBED GROUND
- FL — FILL
- IM — IMPOUNDMENT
- LG — LAGOON
- OF — OUTFALL
- SD — SLUDGE
- ST — STAIN
- SW — SOLID WASTE
- TR — TRENCH
- VS — VEGETATION STRESS
- WD — WASTE DISPOSAL AREA
- WL — WETLAND

Figure 27. Larson AFB study area, July 6, 1989 (17 of 20). Approximate scale 1:9,200.

Figure 28 provides coverage of a waste disposal pit in the southern part of the frame. Potential environmental hazards area:

Empty LG-1: No change is noted.

TR-3: No change is noted.

SW-3: The solid material in this accumulation consists of various hues of what appears to be rubble as well as debris and metal objects.

SW-4: This solid waste contains essentially the same type of materials as SW-3.

A pile of old tires is also visible in this pit.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
- SL STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM MOUNDED MATERIAL (SMALL)
- CR CRATES/BOXES
- DR DRUMS
- HT HORIZONTAL TANK
- PT PRESSURE TANK
- VT VERTICAL TANK
- CA CLEARED AREA
- DG DISTURBED GROUND
- FL FILL
- IM IMPOUNDMENT
- LG LAGOON
- OF OUTFALL
- SD SLUDGE
- ST STAIN
- SW SOLID WASTE
- TR TRENCH
- VS VEGETATION STRESS
- WD WASTE DISPOSAL AREA
- WL WETLAND

Figure 28. Larson AFB study area, July 6, 1989 (18 of 20). Approximate scale 1:9,200.

JULY 6, 1989 (19 of 20)

Figure 29 shows the completion of the waste water treatment plant. Dumping of liquid waste in the adjacent basin is no longer going on. Potential environmental hazards are:

LG-2-8: These lagoons are associated with the treatment plant and are now active. Two of the lagoons are aeration ponds which are operating at the time of the photography. Three of the remaining lagoons are empty at this time.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
- SL STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM MOUNDED MATERIAL (SMALL)

- CR CRATES/BOXES
- DR DRUMS
- HT HORIZONTAL TANK
- PT PRESSURE TANK
- VT VERTICAL TANK

- CA CLEARED AREA
- DG DISTURBED GROUND
- FL FILL
- IM IMPOUNDMENT
- LG LAGOON
- OF OUTFALL
- SD SLUDGE
- ST STAIN
- SW SOLID WASTE
- TR TRENCH
- VS VEGETATION STRESS
- WD WASTE DISPOSAL AREA
- WL WETLAND

Figure 29. Larson AFB study area, July 6, 1989 (19 of 20). Approximate scale 1:9,200.

Figure 30 shows revegetation of the disturbed ground on the west side of the frame. Five small wetland areas are also present where irrigation runoff has accumulated. No potential environmental hazards are noted.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
- SL STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM MOUNDED MATERIAL (SMALL)
- CR CRATES/BOXES
- DR DRUMS
- HT HORIZONTAL TANK
- PT PRESSURE TANK
- VT VERTICAL TANK
- CA CLEARED AREA
- DG DISTURBED GROUND
- FL FILL
- IM IMPOUNDMENT
- LG LAGOON
- OF OUTFALL
- SD SLUDGE
- ST STAIN
- SW SOLID WASTE
- TR TRENCH
- VS VEGETATION STRESS
- WD WASTE DISPOSAL AREA
- WL WETLAND

Figure 30. Larson AFB study area, July 6, 1989 (20 of 20). Approximate scale 1:9,200.